Supplementary Materials

Datasets

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Contents

1 Data

We provide experiment data here. In the slide, some part of the tables were skipped due to its size.

1.1 Experiment Data

The following is the raw dataset:

```
ecg
#> # A tibble: 16 x 7
#>       id date       water speed coffee   pre  post
#>    <dbl> <date>     <dbl> <dbl>  <dbl> <dbl> <dbl>
#>  1     1 2021-04-22     1     1      1    80    89
#>  2     2 2021-04-23     1     2      4    77    78
#>  3     3 2021-04-24     1     3      2    76    83
#>  4     4 2021-04-25     1     4      3    76    79
#>  5     5 2021-04-26     2     1      4    75    77
#>  6     6 2021-04-27     2     2      2    77    83
#>  7     7 2021-04-28     2     3      3    90    93
#>  8     8 2021-04-29     2     4      1    81    95
#>  9     9 2021-04-30     3     1      2    83    87
#> 10    10 2021-05-01     3     2      3    74    77
#> 11    11 2021-05-02     3     3      1    77    78
#> 12    12 2021-05-03     3     4      4    74    74
#> 13    13 2021-05-04     4     1      3    75    77
#> 14    14 2021-05-05     4     2      1    88    92
#> 15    15 2021-05-06     4     3      4    69    71
#> 16    16 2021-05-07     4     4      2    72    76
```

Table 1 is LSD format based on $y_{rc} := y_{rc}^{post} - y_{rc}^{pre}$.

Table 1: Experiment Data

	Drinking Speed			
water	<=5	5-15	15-30	30<
0 ml	HB, 9	W, 1	S, 7	D, 3
100 ml	W, 2	S, 6	D, 3	HB, 14
200 ml	S, 4	D, 3	HB, 1	W, 0
300 ml	D, 2	HB, 4	W, 2	S, 4

[1] Caffeine: HB > S > D > W

[2] Numbers indicate the difference after and before taking coffee

1.2 Science Table

To test sharp null of no effect

$$H_0 : y_{rc}(1) = y_{rc}(2) = y_{rc}(3) = y_{rc}(4) \tag{1}$$

we build the science table in Table 2.

Table 2: Observed Values of the Science Table

				Observed $y_{rc}(k)$			
id	water	speed	coffee	HB	W	S	De
Row 1 (Water 0 ml)							
1	1	1	1	9			
2	1	2	4		1		
3	1	3	2			7	
4	1	4	3				3
Row 2 (Water 100 ml)							
5	2	1	4		2		
6	2	2	2			6	
7	2	3	3				3
8	2	4	1	14			
Row 3 (Water 200 ml)							
9	3	1	2			4	
10	3	2	3				3
11	3	3	1	1			
12	3	4	4		0		
Row 4 (Water 300 ml)							
13	4	1	3				2
14	4	2	1	4			
15	4	3	4		2		
16	4	4	2			4	

Now we impute impute the missing $Y_{rc}(k)$ under the sharp null. See Table 3.

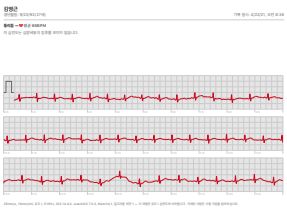
Table 3: Imputed Outcomes under the Sharp Null

				Observed $y_{rc}(k)$			
id	water	speed	coffee	HB	W	S	De
Row 1 (Water 0 ml)							
1	1	1	1	9	9	9	9

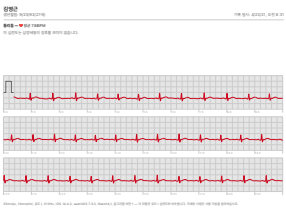
2	1	2	4	1	1	1	1
3	1	3	2	7	7	7	7
4	1	4	3	3	3	3	3
Row 2 (Water 100 ml)							
5	2	1	4	2	2	2	2
6	2	2	2	6	6	6	6
7	2	3	3	3	3	3	3
8	2	4	1	14	14	14	14
Row 3 (Water 200 ml)							
9	3	1	2	4	4	4	4
10	3	2	3	3	3	3	3
11	3	3	1	1	1	1	1
12	3	4	4	0	0	0	0
Row 4 (Water 300 ml)							
13	4	1	3	2	2	2	2
14	4	2	1	4	4	4	4
15	4	3	4	2	2	2	2
16	4	4	2	4	4	4	4

2 ECG Results

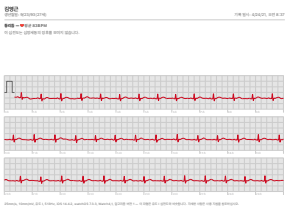
From ECG app, we get the graph as in Figure 1.



(a) (1,1),House blend: 89 BPM

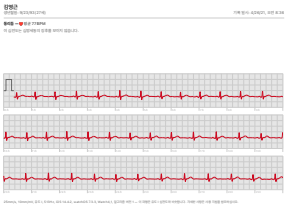


(b) (1,2),Water: 78 BPM

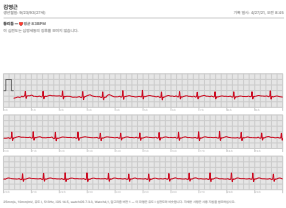


(c) (1,3),Sumatra: 83 BPM

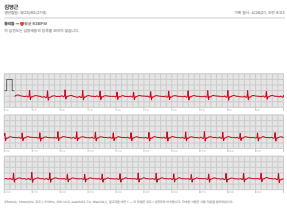
(d) (1,4),Decaf: 79 BPM



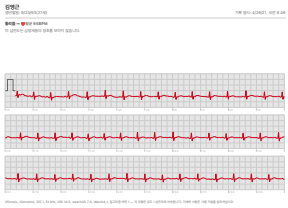
(e) (2,1),Water: 77 BPM



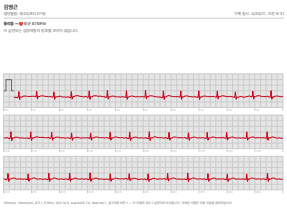
(f) (2,2),Sumatra: 83 BPM



(g) (2,3),Decaf: 93 BPM



(h) (2,4),House blend: 95 BPM



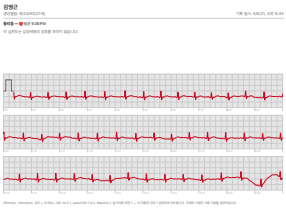
(i) (3,1),Sumatra: 87 BPM

(j) (3,2),Decaf: 77 BPM

(k) (3,3),House blend: 78 BPM

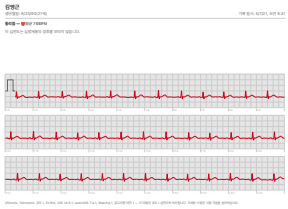
(l) (3,4),Water: 74 BPM

(m) (4,1),Decaf: 77 BPM



(n) (4,2),House blend: 92 BPM

(o) (4,3),Water: 71 BPM



(p) (4,4),Sumatra: 76 BPM

Figure 1: Electrocardiogram after drinking Coffee